CLAIMS

What is claimed is:

1. A method for manufacturing a semiconductor device, comprising:

forming a trench in a surface region of a semiconductor substrate, of a first conductivity type;

forming a drift region, of a second conductivity type, around the trench;

forming a gate insulating film, having a uniform thickness, along a side surface and a bottom surface of the trench and inside the trench;

forming a first conductor along a surface of the gate insulating film

etching back the first conductor in an active region so that the first conductor remains only in side surface regions of the trench;

forming a base region of, the first conductivity type, and a source region, of said second conductivity type, in a surface region of the semiconductor substrate outside the trench;

forming an interlayer dielectric inside said first conductor;

selectively removing a bottom of the interlayer dielectric in the active region;

forming a drain region of, the second conductivity type, at the bottom of the trench; and

forming a second conductor in the trench, the second conductor electrically connecting to the drain region.

2. The method for manufacturing a semiconductor device of claim 1, further comprising:

forming an interlayer dielectric on a surface of the semiconductor substrate;

opening contact holes through the interlayer dielectric;

forming a gate electrode that electrically connects to the first conductor, a drain electrode that electrically connects to the second conductor, and a source electrode that electrically connects to the source region.

3. The method for manufacturing a semiconductor device of claim 1, wherein the etching back of the first conductor includes over-etching the first conductor so that only a portion of the first conductor lower than the surface of the semiconductor substrate remains un-removed.

4. The method for manufacturing a semiconductor device of claim 2, wherein the etching back of the first conductor includes over-etching the first conductor so that only a portion of the first conductor lower than the surface of the semiconductor substrate remains un-removed.